Amanda, Nyana

Problem Statement

For this project the Junior class of Animas High school went to Silverton on October 12 to check the water quality of different creeks and rivers. Period 4 tested the Upper Animas water quality from 9 to 11. Each class took the pH values, turbidity, conductivity, Temperature, and streamflow of all Mineral creek, Cement Creek, and the Upper Animas River. While testing the water quality all groups worked with Steve. Nyana worked with Alan and Josie, while Amanda worked with Ava and Caeley. When not testing the water quality other groups went to learn about invasive plants and assisted in removal of these plants. The junior class also went to the Gold King mine spill to listen and talk to a man named Steve. All classes were combined in order to complete these tasks.

Introduction

From this investigation we are trying to find out what the streamflow, turbidity, pH, conductivity, and temperature are of the Lower Animas River. Once we had gathered all this information from Silverton we created a spreadsheet with this data and used weighted average to predict what the Lower Animas River parameters would be. Finding the parameters and running the tests are using our concepts from chemistry, and the weighted averages are a concept from math class. Stream flow is the discharge or amount of water in cubic feet per second that passes any given point in a river or creek. Turbidity is the cloudiness or transparency of the water in a river or creek. pH is how you express the acidity or basicity of a substance. Conductivity is the degree at which something allows an electrical current to flow through it. Temperature is how hot or cold something is. A weighted average is an average that results from multiplying your different components or numbers by a significant percentage. You could also use the concept, standard deviation from our math class. Standard Deviation is a quantity calculated to determine the extent of fluctuation in a group. It was also helpful for us to look at the central tendency and variability of graphs to help us get an idea for our predictions. Central tendency is how you find the "middle" of the graph using median and mean. Variability is finding the range, minimum, maximum, and standard deviation. Observing these two things on a graph can help find the trend of the graph.

Visuals

Table 1: Water Quality

Within table 1 is the whole junior class data which was determined for each creek. Table 1 states the numbers that we received once testing each value.

Table 2: Pivot table

In this table we calculated the Average, Median, Minimum, Maximum, and standard deviation of each creek on each set a values such as pH, Temperature, Turbidity, Conductivity, and Streamflow.

Table 3: Predictions

Within this table we made calculations using weighted averages in order to predict what the parameters of the lower Animas would be.

Methods/Process

When in Silverton we first started by walking to the Upper Animas River. Steve then gave us instructions as to what to do with the different kind of testing that was to take place. Amanda's group then began taking the turbidity of the water. That process was done by collecting a sample of the water and used a 1 point calibration on the device called Turbidity sensor. Next, she took the temperature of the river by inserting a thermometer into the water. She then took the pH of the water by doing a 2 point calibration which consists of taking the pH wand and calibrating it with 2 substances with known pH's of

7 and 10. We then took the pH wand and put it into the water by doing that we received the pH value of the water. Lastly, Amanda tested the conductivity of the water, that consisted of taking a Conductivity rod and putting that into the river and doing a 2 point calibration. Her group then let the rod sit to make sure that the what the rod was reading is concise and does not fluctuate . Then she pulled the rod out of the water and recorded the readings.

Nyana, Alan, and Josie tested almost all the same values but instead of testing the conductivity Nyana's group tested the stream flow. In order to test the stream flow one was to go into the water. When getting into the water that one person was to bring a yard stick and walk across the river with a measuring tape. Then that person had to put the measuring tape at the side of the river to get the full and exact width of the river. Then taking the yardstick we had to get the depth of the shore line, then a quarter of the way we had to measure the depth, then we had to walk to the middle of the river and measure the depth there, then ¾ of the river, and then finally the other shoreline of the river. We then took the Streamflow rod and measured the flow of the river from each of those spots as well. Both groups then recorded all the data that received while testing and headed back to the cars.

In class we then worked on google sheets, within google sheets we received data from all 3 classes on each stream. From the class data we then created a pivot table and calculated the average, median, minimum, maximum, and standard deviation for temperature, streamflow, conductivity, and the turbidity of all three streams. With all of this data were able to make calculations and predictions on the Lower Animas. We received help from Steve and peers while putting this pivot table together and making our calculations.

Solution/Predictions

The data we collected from different groups in each river section was not very consistent, which caused a bit of lack in confidence from the beginning. As we moved forward and removed outliers to make our data more reliable and start calculations we grew more confident in the process. We took the gathered data from the pivot tables we had made and used the found averages to start finding weighted averages which would help us predict our parameters for the Lower Animas. Some data points that we threw out are one of the points from the Upper Animas and one from Mineral Creek. The point from the Upper Animas that was not relevant was a conductivity of 865, and the point from Mineral Creek was the streamflow of 77.25. We decided these were irrelevant because they were outliers and could throw off our averages. Our predictions on Cement Creeks temperature was 9.48, our predictions for pH was 3.82, for conductivity it was 989, our predictions for turbidity was -0.23, and our predictions for streamflow in Cement Creek was 28.94. Our predictions for Mineral creeks Temperature, pH, Conductivity, Turbidity and Streamflow was 6.88, 7.05, 427, 13.7, 49.97 respectively. Our prediction for the Upper Animas Temperature, pH, Conductivity, Turbidity and Streamflow was 4.72, 6.51, 583.5, -1.15, 12.91 respectively. The predictions that we calculated for the Lower Animas for Temperature, pH , Conductivity, Turbidity, and Streamflow was 7.41, 5.94, 628.75, 7.16, 91.82. The USGS data was a 5% difference in temperature compared to the predictions that we calculated. USGS did not have data for the pH , Conductivity, or Turbidity. USGS data had a 11% difference in Streamflow. Since there was no data for pH, conductivity, or turbidity on the day that we went, we instead looked at the data collected over a span of multiple days to find what the parameters would be around so we could compare our predictions. Those would be between 6.5-7 for pH, 510-530 for conductivity, and 5-10 for turbidity. In the table

below we are showing how we made calculations to find predictions and compare them. We first found mean and used each mean found for the different parameters to then find weighted averages, our example is temperature in degrees Celsius. To find weighted average you take the previously found average and multiply it by a percentage, which was our streamflow percentage, and add all of those products together. Once we had all our predictions by doing this process we compared our solutions to the USGS data by finding the percentage difference which is also shown in the table below. We believe that our predictions are not quite right based on the comparisons to the USGS data, we found we were in a range of their findings but we believe our data, when being measured, was not as accurate as theirs. Even though our process was reliable and this method would get us accurate predictions it was changed when we started with data points that were not accurate.

Type of Equation	Example of Calculations
Mean	(9.1+9.6+9.5+9.5+9.8+9.4)/6=9.48
Weighted Average	(9.48*0.32)+(6.88*0.54)+(4.72*0.14)= 21.08
Percentage difference	(7.41-7)/7=.05*100=5%

Evaluation

Learning about the water quality in the Animas river was very educational, but it was information that we already knew. Which was that mines do affect the water quality of the river. It was educational in the fact that we learned how to find the turbidity, we learned how to test the pH, and the conductivity of the water which was something neither one of us knew how to do. To make the problem that we are trying to solve better could be explaining what the numbers we found really mean. This was a pretty fun problem to work on because it allowed us to get out of the classroom, and then apply water testing to a body of water that affects us as a community. Due to the fact that the water that we tested did affect us in sometype of way made it more enticing. The hardest part of this project was trying to calculate and come up with predictions for the Lower Animas.

Importance

The importance of finding all of the temperature, turbidity, conductivity, pH, and streamflow the Upper Animas is that it all has some type of effect on the water. For example, if the pH value of the water is low that means that the water is pretty acidic meaning that the life that is in the water are potentially in danger thus then affecting the people of Durango. Test all these different aspects allows us to see if the water quality within our river is healthy. The calculations that we received told us that the Upper Animas is not acidic thus not harming the wildlife and the people of durango. The turbidity of the Upper Animas is vaguely cloudy thus allows us to see what is at the bottom of the river which means that the water is becoming healthy. All of the results that we found while performing these test was that the Upper Animas

is healthy and becoming healthier. Doing these test and learning about water quality made me realize how everything is more connected then I thought. Learning about water quality and how it affects almost everything was important in itself.

Self Assessment

The grade that we think that we should receive is an A. We should receive an A because while writing this lab we took our time in order to produce beautiful work, we asked clarifying questions, and edited the work that we produced repeatedly. We spent a lot of time, and put a lot of effort into this project in order to produce A quality work. We spent a lot of time attempting to make accurate calculations, and analyzed the probability of our accuracy, in order to understand whether our calculations were correct or off. All of these points add up to our belief that we deserve and A.